

Examining pathways linking maternal depressive symptoms in infancy to children's behavior problems: The role of maternal unresponsiveness and negative behaviors

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Abstract:

The extent to which maternal depressive symptoms in the first 6 months of life is linked with internalizing and externalizing behaviors in childhood through specific insensitive maternal behaviors (unresponsive and overtly negative behaviors) was examined in a sample of 259 mother-infant dyads. In addition, the extent to which these paths were moderated by infant negative emotionality was also examined. Maternal depressive symptoms were assessed prenatally and when infants were 6 months and 2 years old. Maternal unresponsive and overtly negative behaviors and infant negative emotionality were observed when infants were 6 months old. Mothers reported on infant's internalizing and externalizing behaviors when infants were 2 years old. Maternal depressive symptoms were directly associated with higher internalizing behaviors; this path was not mediated by maternal behaviors. Depressive symptoms were unrelated to externalizing symptoms. Infant negative emotionality did not moderate these effects, but was related positively to overtly negative maternal behaviors, and temperament interacted with maternal depressive symptoms to predict unresponsive maternal behaviors. Results suggest that early maternal depressive symptoms, infant negative emotionality, and negative maternal behavior pose risk for infants' later internalizing behaviors, but the proposed moderated mediation model was not supported.

Keywords: Maternal depression | Internalizing behaviors | Externalizing behaviors | Maternal unresponsive behaviors | Maternal negative behaviors | Temperament | Negative emotionality

Article:

1. Introduction

Maternal depression is a common psychological disorder, affecting mothers while pregnant and during the postpartum period, with a prevalence ranging from 8%–13% (Field, 2010). Approximately 16–23% of new mothers experience moderate to severe depressive symptoms, and mild symptoms are seen in another 11–15% throughout the first year following childbirth, all of which may undermine functioning (Mayberry, Horowitz, & Declercq, 2007). Infants of mothers with elevated depressive symptoms are at greater risk for subsequent psychopathology, including internalizing and externalizing behaviors (Sellers et al., 2014; Vafai, Steinberg, & Shenassa, 2016), and early child psychopathology can extend to adulthood (Moffitt, 2003). Thus, identifying the pathways linking depressive symptoms to specific types of child psychopathology has important implications for the development of appropriate screening, prevention, and intervention efforts.

Prior research has demonstrated that mothers with elevated depressive symptoms sometimes engage in distinct types of maladaptive behaviors (e.g. withdrawn or intrusive; Field, 2010), each of which may have different implications for subsequent outcomes (Goodman, Rouse, Long, Ji, & Brand, 2011). Additionally, infants may vary in the extent to which they elicit maladaptive maternal behaviors, and are adversely affected by negative environmental experiences as a function of their temperamental dispositions (Cicchetti, 2010). The goal of this study is to examine a moderated mediation model in which the associations between early maternal depressive symptoms and subsequent internalizing and externalizing symptoms are mediated by unresponsive and overtly negative maternal behaviors and moderated by infant negative emotionality. This model is consistent with Goodman and Gotlib's (1999) developmental psychopathology model such that maternal insensitivity and compromised maternal mental health, particularly depressive symptoms, have been implicated as precursors of child psychopathology, especially for infants with vulnerability characteristics. The proposed model is also consistent with the transactional model of development in that infant characteristics may also contribute to individual differences in the quality of caregiving, which may in turn explain variations in infant outcomes (Sameroff, 2009). In the following sections, we describe each path in this moderated mediation model.

1.1. Maternal depressive symptoms and sensitive maternal behavior

Sensitive caregiving refers to the mother's ability to notice, understand, and respond consistently and appropriately to an infant's cues, in a manner that prioritizes the infant's needs (Ainsworth & Bell, 1970). A variety of evidence indicates that elevated depressive symptoms undermine a mothers' ability to engage in sensitive behavior. For example, mothers with depressive symptoms may focus on their own emotional and physical needs ahead of their infants' needs, and struggle to read infant cues, leading to less adaptive behaviors (Dix, Moed, & Anderson, 2014; Schuetze & Zeskind, 2001). Such mothers may also experience hostility towards their infants, which may also undermine caregiving quality (McCabe, 2013).

Furthermore, depressive symptoms are linked with lower maternal self-efficacy, which may contribute to less maternal involvement in caretaking and lower quality parent-infant interaction (Leerkes & Crockenberg, 2002; Weaver, Shaw, Sishon, & Wilson, 2008). In a meta-analytic review, Lovejoy, Graczyk, O'Hare, and Newman (2000) found that mothers with elevated depressive symptoms are less responsive to child behavior, including positive and negative

behaviors, and have more negative interactions with their infants. Next, we describe specific patterns of insensitive maternal behavior, which may characterize the interactions between mothers with elevated depressive symptoms and their infants.

1.2. Subtypes of insensitive maternal behaviors and links with child psychopathology

Although most researchers focus on the extent to which mothers are low or high on sensitivity, it is important to note that there are different styles of insensitive behavior, which may have different implications for child outcomes and for intervention efforts. In fact, maternal depression has been linked with two distinct types of insensitivity: intrusive (overtly negative) and withdrawn (unresponsive) behaviors (Hart, Jones, Field, & Lundy, 1999; Wang & Dix, 2013). However, not much is known as to which type of insensitive behavior is linked specifically to internalizing and externalizing behaviors. There is reason to expect both types of insensitivity (unresponsive and overtly negative) could contribute to both types of child outcomes simultaneously as described below.

Unresponsive maternal behavior is characterized by indifference, withdrawn affect, distracted actions, limited responsiveness to infant cues, and a lack of interaction (Field, 2010, Hart et al., 1999; Taylor, Eisenberg, Spinrad, & Widamann, 2013). Unresponsive mothers engage in less infant-directed speech, are low in energy, touch their infants less frequently, and engage in a less affectionate manner than more responsive mothers (Field, 2010). Consequences from unengaged and indifferent maternal behavior may include children's development of low self-esteem, feelings of emotional insecurity, somatic complaints, sadness, and anxiety (Mayberry et al., 2007). Further, infants begin to mimic their mothers' flat, withdrawn affect and socially engage less with others (Field, 2010). As such, unresponsive maternal behavior is likely to be linked with child internalizing symptoms.

On the other hand, unresponsive maternal behavior may contribute to infant difficulties in regulating emotions. Initially they may learn to suppress the expression of negative emotions, (Cassidy, 1994), but over time this pattern of over control may come at a cost physiologically that cannot be maintained (Shaw, Owens, Givaneli, & Winslow, 2001). As such, some infants of unresponsive mothers may shift to a pattern of emotion under-control over time, leading to reactive, aggressive, and impulsive behaviors, which serve as indicators of externalizing behaviors (Cicchetti, 2010, McCullough and Shaffer, 2014).

Overtly negative maternal behavior is a second type of insensitive parenting, defined as controlling, harsh, and intrusive behaviors (Sellers et al., 2014, Taylor et al., 2013). Indicators include speaking to an infant harshly, expressing negative affect towards the infant, intrusiveness (i.e. mothers forcing own agenda onto the infant), persistent use of ineffective behaviors even if an infant's signals suggest a modification is warranted, and mismatched affect such as laughing at a distressed infant. Such behaviors may be frightening or anxiety provoking for infants, and could instill feelings of inadequacy, all of which could increase infants' internalizing symptoms (Feng, Shaw, & Moilanene, 2011).

Overtly negative maternal behaviors may also put infants at risk for externalizing behaviors. When mothers engage in aggressive, impatient, intrusive behaviors, infants may begin to model

these behaviors, creating a coercive pattern of interaction. Such maternal behaviors may also increase infant frustration, which has been linked with elevated externalizing symptoms, including impulsiveness and defiance as infants seek to assert their own will (Chang, Schwartz, Dodge, & McBride-Chang, 2009; Haskett & Willoughby, 2006). In addition to maternal behavior, infant characteristics also contribute to later maladaptive outcomes.

1.3. Child temperament as a moderator

The mother-child relationship consists of reciprocal, on-going interaction in which each partner influences the other. Child characteristics, including temperament, are highly relevant to understanding the nature of early parent-child interaction and its influence on infant's later adjustment. One aspect of child temperament that may influence maternal behavior and how the infant responds to maternal behavior is infant negative emotionality. Infants who are high in negative emotionality express negative emotions frequently and intensely, are easily distressed, and demonstrate difficulty soothing (Rothbart, 2011).

Infant negative emotionality may prompt maternal unresponsiveness via learned helplessness in which mothers begin to withdraw from their infants when they believe their efforts to intervene are unsuccessful at soothing their infants (Leerkes and Crockenberg, 2002, Rothbart, 1986). Alternatively, infant negative emotionality may prompt overtly negative responses because infant crying is aversive, and can elicit negative feelings toward the infant (Leerkes et al., 2015). Of most relevance, women with elevated depressive symptoms whose infants are high on negative emotionality may be at dual risk for compromised maternal behaviors. Consistent with this view, several studies have demonstrated moderated effects such that links between maternal risk factors (e.g. depression, low maternal self-efficacy, low social support, and negative social cognition) and compromised maternal behavior are stronger among mothers of infants high in negative emotionality (Crockenberg & Leerkes, 2003).

Moreover, temperamentally negative infants may be more dependent on caregiving assistance for regulating their emotions. Therefore, insensitive maternal behavior may be particularly consequential for their social and emotional development (Leerkes, Blankson, & O'Brien, 2009). According to the dual risk or diathesis-stress perspective (Monroe & Simons, 1991), poor environmental experiences, including insensitive maternal behavior, are more likely to negatively impact infants who carry vulnerability factors, such as difficult temperament, than those individuals who lack such vulnerability factors (Mesman et al., 2009). This perspective is consistent with Goodman and Gotlib's (1999) model in which they suggest some infants may be at greater risk for developing psychopathology in the context of maternal depressive symptoms by virtue of their characteristics. Therefore, we predict infant negative emotionality will exacerbate the links between maternal depressive symptoms and both unresponsive and overtly negative maternal behavior, and the links between insensitive maternal behaviors and infant internalizing and externalizing behaviors.

1.4. The present study

The goal of this study is to examine the effects of early maternal depressive symptoms, assessed during the third trimester and at 6 months postpartum, on infant internalizing and externalizing

behaviors at age 2, through a moderated mediation model. We examine distinct mediated pathways from maternal depressive symptoms to child psychopathology outcomes via overtly negative maternal behavior and unresponsive maternal behavior assessed at 6 months. Infant negative emotionality, assessed at 6 months, is examined as a moderator of both paths from depressive symptoms to maternal behaviors, and the paths from both types of insensitive maternal behavior to infant outcomes. We hypothesize that: (1) maternal depressive symptoms will be positively associated with internalizing and externalizing behaviors through both overtly negative and unresponsive behaviors; and (2) infant negative emotionality will moderate indirect effects from maternal depression to infant outcomes such that the indirect pathway will be stronger among dyads with infants high on negative emotionality than among dyads with infants low on negative emotionality. Given maternal sensitivity to infant distress cues has been demonstrated to be a stronger predictor of early behavior problems than maternal sensitivity to non-distress cues (Leerkes et al., 2009), we observed unresponsive and negative maternal behaviors during distress-eliciting tasks. Maternal demographic characteristics and maternal depression at 2 years (concurrent to the outcomes) are considered as possible covariates.

2. Method

2.1. Participants

Participants in the current study were 259 primiparous mothers (128 European American, 123 African American, 8 multiracial) and their infants from the southeastern United States. Mothers ranged in age from 18 to 44 years ($M = 25.05$, $SD = 5.41$) at recruitment. Twenty-seven percent had a high school diploma or less, 27% had attended but not completed college, and 46% had a 4-year college degree. The majority (71%) of mothers were married or living with their child's father, 11% were dating but not living with their child's father, and 18% were single or not living with the child's father. Annual family income ranged from less than \$2000 to over \$100,000; median income was \$35,000. Of the initial 259 participants, 212 mothers provided data on infants' behavior problems at age 2. The primary reasons for missing data were inability to locate or contact mothers, moving from the area or being too busy. All participating infants were full term; 51% were female.

2.2. Procedures

Expectant mothers were recruited at childbirth classes offered in the local hospital and public health department, breastfeeding classes offered through the Special Supplemental Nutrition Program for Women, Infants and Children, obstetric practices, and word of mouth. During the prenatal period, mothers were mailed a variety of questionnaires, including measures of demographics and depressive symptoms that they completed and returned when they visited campus for an interview. Mothers and infants visited our laboratory for a videotaped observation of mother-infant interaction when infants were 6 months old. Mothers also were mailed questionnaires including measures of depressive symptoms (6 months, 2 years) and infant behavioral problems (2 years). Mothers received \$50 and a gift at the completion of each visit.

During the 6-month laboratory visit, infants and mothers participated in a free play procedure followed by 3 distress inducing tasks while being video recorded (Leerkes, 2010). The *arm*

restraint task, designed to illicit infant frustration, consisted of infants being strapped in a car seat while an experimenter gently held the infant's arms down and did not interact with the infant. The *novelty toy task*, designed to illicit infant fear, consisted of infants sitting in a car seat, tucked into a table, while a remote controlled truck approached the infant two times. The truck vibrated, had blinking lights and loud sirens. For both the restraint and novelty tasks, mothers were instructed to sit next to their infants without interacting and to have a neutral face for the first minute, and then they could interact with the infant in any way they chose for the next 3 min. A large basket of age appropriate toys and books were available within mothers' reach. The final distress eliciting task was the *still face procedure* (Tronick, Als, Adamson, Wise, & Brazelton, 1978), where infants remained in the car seat, and mothers' chairs were placed in front of infants such that they were eye level with one another, but sitting a few feet apart. First, mothers were instructed to interact with their infant for two minutes as they usually would. Next, mothers were asked to look at their infant with a neutral face for 2 min. Finally, mothers were instructed to interact and play with their infant as they normally would for 2 min (re-engagement phase).

3. Measures

3.1. Depressive symptoms

Mothers self-reported their depressive symptoms prenatally, at 6 months, and at 2 years using the Center for Epidemiological Studies-Depression Scale (CES-D; Radloff, 1977), which is a 20-item checklist of cognitions, moods, and feelings that are associated with depressive symptoms, and is designed for use with community samples. Items on this scale were summed at each time point (Cronbach's alphas = 0.87, 0.90, and 0.87, respectively). Given depressive symptoms were not assessed in the early postpartum period, and other research has demonstrated that depressive symptoms in the third trimester are moderately to highly correlated with depressive symptoms in the early postpartum months (Parade, Blankson, Leerkes, Crockenberg, & Faldowski, 2014; Skouteris et al., 2009), we used our measure of prenatal depression as a proxy measure of depressive symptoms in the early postpartum. In our sample, depressive symptoms prenatally and at 6 months correlated significantly ($r = 0.42, p < 0.001$), and thus were averaged to create a measure of average depressive symptoms across the early postnatal period. Depressive symptoms at 2 years was used as a covariate to ensure any association between early maternal depressive symptoms and child behavior problems was not merely an artifact of concurrent maternal depressive symptoms.

3.2. Maternal behaviors at 6 months

Maternal behavior and infant affect were continuously coded from digital media files using INTERACT 9 (Mangold, Arnstorf, Germany). During the distress eliciting tasks, maternal behaviors were continuously coded using 12 mutually exclusive categories (mismatched affect, intrusive, negative, distracted, withdrawal, persistent ineffective, task focused, monitor, supportive, calming, non-task focused engagement, and routine care; Leerkes, 2010). Event based continuous coding was used such that once a behavior was coded it remained active until a different behavior was coded as described in (Leerkes, 2010). The percentage of time mothers engaged in each behavior during each task was calculated, and two composites were created.

Unresponsive behavior is the percent of time mothers monitored (passively watched infant), were distracted (looked away from infant or engaged in behavior not related to the infant or caregiving), and were withdrawn from their infants (moved or walked away from infant or ended interaction abruptly). Overtly negative maternal behavior is the percent of time mothers engaged in mismatched affect (laughed while infant was distressed), intrusive (forced own agenda onto the infant), negative (directed negative affect towards their infant or intense discipline), and persistent ineffective behaviors (used the same ineffective behaviors when other options existed, for example soothed infant in same manner without altering the behavior even when infant remained distressed). Two coders, blind to other data, were trained by the second author. Inter-rater reliability was $r = 0.90$ for both the percent of time engaged in unresponsive behavior and overtly negative behavior based on 34 randomly selected, double coded cases. Eighty-nine percent of mothers engaged in unresponsive behavior, and 100% of mothers engaged in overtly negative behavior.

3.3. Infant affect at 6 months

At 6 months, *infant affect* was continually rated using event based coding from the videotapes of the arm restraint, novelty toy (truck), and still face tasks. Infant emotionality was rated on a 7-point scale adapted from Braungart-Rieker and Stifter (1996) based on infants' facial expressions, body tension, and vocalizations ranging from (1) high positive affect (intense laughing or squealing) to (7) high negative affect (intense wails, screams, or sobs), with a rating of 4 reflecting neutral affect. For this coding system, 34 videotapes were double coded for inter-rater reliability, with a weighted kappa = 0.76. The mean level of affect was calculated for each task, and then averaged across tasks (Cronbach's $\alpha = 0.67$); a high score indicates higher infant negative affect.

3.4. Infant behavior problems at 2 years

Mothers completed the Brief Infant Toddler Social Emotional Assessment (BITSEA; Briggs-Gowan, Carter, Irwin, Wachtel, & Cicchetti, 2004) when infants were 2 years of age. The BITSEA is a 42-item measure that assesses toddler behavior problems and social and emotional competency. Each item is scored on a 3-point scale ranging from 0 for not true or rarely true to 2 for often or very true. Following revised scoring suggestions by Briggs-Gowan et al. (2013), 14 items reflecting internalizing were averaged (Cronbach's $\alpha = 0.70$; e.g., seems very sad, unhappy, or withdrawn; seems nervous or fearful; and avoids physical contact) and 7 items reflecting externalizing were averaged (Cronbach's $\alpha = 0.59$; e.g., is destructive; hits, shoves or bites other children; purposely tries to hurt you; runs away in public places). In prior research, these subscales showed convergent validity with the internalizing and externalizing subscales of the Child Behavior Checklist (Briggs-Gowan et al., 2013).

3.5. Demographics at prenatal phase

During the prenatal period, mothers reported their race, age, education, marital status, and family income. Race was coded as 0 = African American and 1 = European American. In an attempt to reduce the remaining demographic data, an exploratory factor analysis was run including marital status, maternal education, and income-to-needs ratio (the ratio of reported income to the federal

poverty guideline for poverty based on family size). A single factor with an Eigen value of 2.57 that accounted for 64.28% of the variability emerged. Factor loadings ranged from 0.40 to 0.75. Thus, the measures were standardized and averaged together to create a single composite reflecting socio-economic status for use as a potential covariate. Higher scores indicate higher socio-economic status.

4. Results

Means and standard deviations for key variables and covariates, along with their inter-correlations are presented in Table 1. Most of the zero-order correlations were consistent with expectations. African American mothers and mothers with lower SES reported higher depressive symptoms, and rated their children higher on externalizing and internalizing behaviors; male infants were rated by mothers as having higher externalizing problems than female infants. Maternal depressive symptoms across the first year were associated positively with externalizing and internalizing behaviors and unresponsive maternal behavior, but not with overtly negative maternal behavior. Infant negative affect was positively correlated with overtly negative maternal behavior but not with unresponsive maternal behavior, infant internalizing, or externalizing behaviors. Lastly, unresponsive maternal behavior was positively correlated with both internalizing and externalizing behaviors, and overtly negative maternal behavior was positively correlated with internalizing but not externalizing behaviors.

Table 1. Means, Standard Deviations, and Zero-Order Bivariate Correlations among Variables.

	1	2	3	4	5	6	7	8	9	10	11	12
1. Race (European American = 1)	–											
2. Child sex (Male = 1)	0.02	–										
3. Socio-Economic Status	0.47	0.06	–									
4. Depression 2Y	–0.17	0.06	–0.31	–								
5. Depression Prenatal	–0.15	–0.06	–0.26	0.46	–							
6. Depression 6M	–0.25	0.01	–0.29	0.49	0.42	–						
7. Depression Prenatal & 6M	–0.20	–0.03	–0.31	0.55	0.85	0.86	–					
8. Observed Infant Affect 6M	–0.13	–0.06	–0.12	0.03	0.05	0.02	0.04	–				
9. Unresponsive parenting 6M	–0.19	0.03	–0.38	0.25	0.17	0.38	0.32	0.02	–			
10. Overtly Negative parenting 6M	–0.08	–0.06	–0.15	0.11	0.09	0.06	0.08	0.71	–0.01	–		
11. Internalizing 2Y	–0.29	–0.07	–0.28	0.39	0.33	0.41	0.42	0.13	0.25	0.17	–	

	1	2	3	4	5	6	7	8	9	10	11	12
12. Externalizing 2Y	-0.15	0.17	-0.17	0.31	0.24	0.28	0.28	-0.01	0.20	0.04	0.50	-
Mean	49.4	49.2	-0.02	9.95	13.64	10.69	12.38	4.43	19.03	6.13	4.14	2.51
Standard deviation	-	-	0.87	7.97	8.71	9.54	8.03	0.43	11.88	7.13	3.03	1.98

Note. *n* ranges from 173 to 212. The means for race and sex reflect percentages. Bold indicates significant at $p < 0.05$. Prenatal = prenatal phase; 6 M = 6 month; 2Y = 2 year.

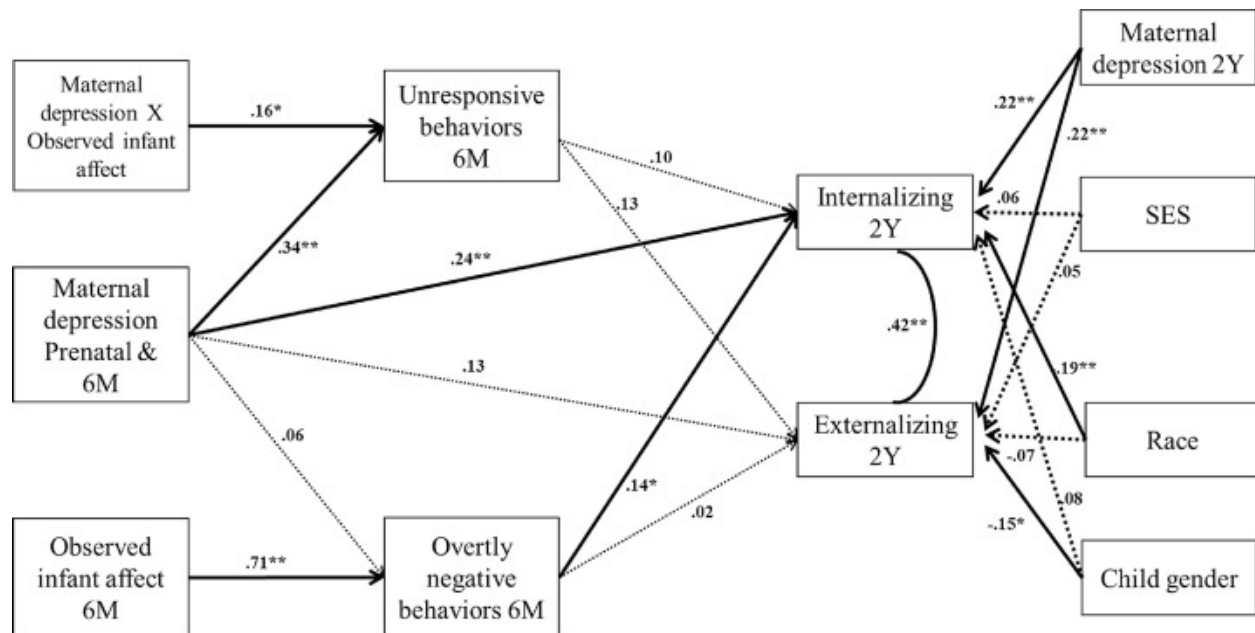


Fig. 1. Associations among maternal depression at prenatal phase and 6 months, observed infant affect at 6 months, maternal behavior at 6 months, and infant behavior problems at 2 years. Values are standardized coefficients. Solid lines indicate significant at $p < 0.05$; dotted lines indicate not significant at $p > 0.05$. Racial differences were not significant.

Hypotheses were examined by conducting path analysis with Mplus version 7.4 (Muthén & Muthén, 2012). Missing data were handled in the primary analyses via full information maximum likelihood (FIML), which takes all available data into account. In the path model (Fig. 1), maternal depressive symptoms prenatally and at 6 months were specified as exogenous variables that predicted infant behavior problems at 2 years. Maternal unresponsive and overtly negative maternal behaviors at 6 months served as potential mediators. A bootstrap approach was implemented to identify the indirect effects. It is one of the valid and powerful methods for testing mediating effects because it uses a resampling strategy to calculate indirect effects with no assumption about the shape of sampling distribution of the coefficients (Preacher, Rucker, & Hayes, 2007). Non-significant interaction effects were removed from the final model to maintain model parsimony. Race, infant gender, maternal depressive symptoms at 2 years, and socio-economic status were specified as exogenous control variables linked to infant behavior problems. Given the characteristics of the sample, possible racial differences were examined using multi-group analyses by comparing a model with all paths (paths involving race were

removed first) constrained to equality with one that had all paths freely estimated across African American and European American families using a Wald test.

The final path model demonstrated good fit to the data: $\chi^2(12) = 15.70$; $p > 0.05$; $CFI = 0.988$; $RMSEA = 0.034$ (90% CI, 0.000, 0.076); $SRMR = 0.027$. Standardized coefficients for the structural paths are presented in Fig. 1. Early maternal depressive symptoms were directly associated with internalizing problems but not externalizing problems at 2 years. Maternal depressive symptoms were positively associated with unresponsive maternal behavior at 6 months, and this effect was moderated by observed infant affect ($b = 0.25$, $B = 0.16$, $p < 0.05$). Specifically, as shown in Fig. 2, maternal depressive symptoms were positively associated with unresponsive maternal behavior when observed infant negative affect was highly negative ($+1 SD$, $b = 0.76$, $p < 0.01$), but maternal depression was not significantly associated with unresponsive maternal behavior when observed infant negative affect was low ($-1 SD$, $b = 0.27$, ns). Unresponsive maternal behavior, however, was not significantly associated with internalizing or externalizing. Maternal depressive symptoms did not predict overly negative maternal behavior at 6 months, but observed infant affect was positively associated with overly negative maternal behavior ($b = 11.65$, $B = 0.71$, $p < 0.01$). Overly negative maternal behavior was associated positively with internalizing but not externalizing problems. Although not hypothesized, a significant indirect effect between infant negative emotionality at 6 months and internalizing behaviors at 2 years of age was apparent via negative maternal behavior ($b = 0.10$, 95% CI, [0.01, 0.18]). The interactions between observed infant affect (a) and maternal depression in relation to overly negative maternal behavior and both (b) unresponsive and (c) overly negative maternal behavior in relation to child behavior problems were not significant and were removed from the final model. Finally, none of the proposed indirect or moderated indirect effects were significant in relation to infant internalizing or externalizing symptoms.

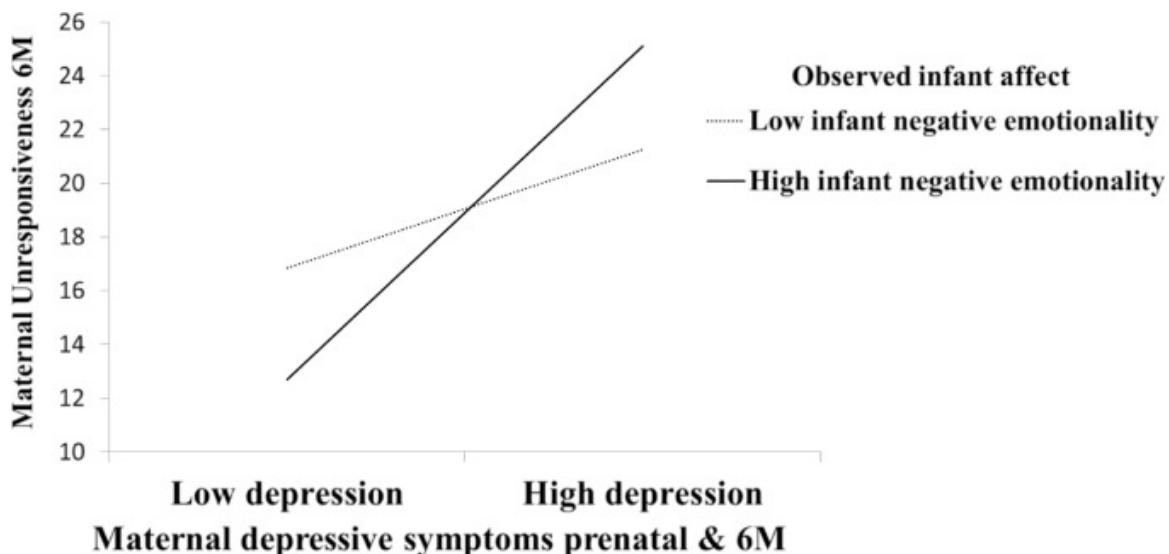


Fig. 2. Maternal depression at prenatal phase and 6 months interacted with observed infant affect at 6 months predicting unresponsive maternal behaviors at 6 months.

Given the composition of our sample, invariance of the structural paths was examined across African American and European American mothers using multi-group analysis. The comparison between the constrained model and the model in which the structural paths were allowed to vary was not significantly different, $\Delta\chi^2 = 12.66$, $\Delta df = 11$, $p > 0.05$, suggesting path coefficients did not differ across racial groups.

5. Discussion

The goal of this project was to examine the extent to which early exposure to maternal depressive symptoms is linked with internalizing and externalizing problems among 2 year olds through two types of insensitive maternal behaviors, overly negative and unresponsive. Infant temperament was examined as a moderator of the paths between depressive symptoms and both insensitive maternal behavior paths, and the paths from insensitive maternal behavior to both infant outcomes. There was little support for this moderated mediation model. However, as discussed below, the results indicate maternal depressive symptoms early in the first year of life have a lasting effect on children's internalizing behavior independent of mother's observed behaviors and concurrent depressive symptoms. Additionally, both depressive symptoms and high infant temperamental reactivity undermine sensitive maternal behavior, which has implications for children's later development.

5.1. Predictors of maternal behavior

Consistent with the hypothesis, and prior research (Mantymaa et al., 2012), maternal depressive symptoms were linked with more unresponsive maternal behaviors. Unresponsive maternal behaviors, including limited reaction to infant cues and distracted actions, may stem from the tendency of mothers with elevated depressive symptoms to focus on their own needs more so than their infants' (Dix et al., 2014). This effect was particularly apparent among mothers of infants who displayed high negative affect, consistent with a dual risk perspective. That is, the tendency of depressed mothers to withdraw socially may be magnified when faced with a persistently distressed infant who may further erode their confidence in their caregiving and provide limited positive reinforcement for continued efforts to intervene in distressing tasks (Crockenberg & Leerkes, 2003).

In contrast, maternal depressive symptoms were not significantly associated with overtly negative behavior. Presumably, irritability may be more strongly linked with negative behavior than other symptoms of depression (Lovejoy et al., 2000); examining the links between specific types of endorsed depressive symptoms and maternal behaviors could tease this out in future research. The most robust predictor of negative maternal behavior was infant negative emotionality; in fact this was the strongest of all tested associations. Infants who cry frequently may elicit maternal distress and undermine a mother's ability to self-regulate in the moment, which may contribute to the use of negative behaviors, such as intrusiveness or persistent ineffective behaviors. Alternatively, negative maternal behavior may elicit or amplify infant distress because such behaviors are likely aversive to infants. We suspect both are true as infants and their mothers have a dynamic, reciprocal interactive relationship, where each has influence and is being influenced by the other. Given negative behavior has implications for later

internalizing symptoms as discussed below, intervention efforts that attempt to prevent such cycles of mother-infant interaction are important.

5.2. Pathways to internalizing behaviors

Consistent with Goodman and Gotlib's (1999) model for the transmission of psychopathology to offspring of depressed mothers, elevated maternal depressive symptoms were linked with children's elevated internalizing symptoms. Counter to prediction and prior research (Kim-Cohen, Moffitt, Taylor, Pawlby, & Caspi, 2005), this effect was not mediated by either of the examined maternal behaviors. Conditions for indirect effects were not met for unresponsive maternal behavior because, although depressive symptoms predicted greater unresponsive behavior, unresponsive behavior was not linked with internalizing in this sample. Finally, infant temperament did not exacerbate links between maternal depressive symptoms and child internalizing behaviors, nor the links between both insensitive maternal behaviors and child internalizing behaviors.

There were three maternal behaviors that contributed to the unresponsive maternal behavior composite: withdrawal, distraction, and monitoring behaviors. In the distress-eliciting tasks, there were no other competing demands for mothers, and therefore, it seems likely that withdrawal from the infant and distraction are consistently maladaptive in this context because they are egregious forms of insensitivity. But, monitoring was the most frequent of the three behaviors, and monitoring, that is watching without intervening, may only be maladaptive when infants are signaling mothers that they need assistance by fussing or looking toward the mother. Monitoring may be adaptive when infants are calm or expressing interest in the task. This may explain the null association between unresponsiveness and internalizing symptoms.

Likewise, conditions for indirect effects were not met for overtly negative behavior because maternal depressive symptoms were unrelated to overtly negative maternal behavior. However, overtly negative maternal behavior at 6 months was linked with toddlers' heightened internalizing symptoms at 2 years. And, although not hypothesized, there was an indirect effect of infant negative emotionality at 6 months on later internalizing via overtly negative maternal behavior. Negative and intrusive maternal behaviors may undermine the emotional adjustment and regulation strategies of infants (Calkins, Propper, & Mills-Koonce, 2013; Propper, Willoughby, Halpern, Carbone, & Cox, 2006). When parental interactions are hostile and potentially fear inducing, even for a small proportion of time, infants may become anxious and withdrawn. These results serve as an important reminder that overtly negative maternal behavior can contribute to internalizing symptoms and not just externalizing symptoms, as is often emphasized (Feng et al., 2011), and that infant characteristics play a role in shaping the quality of caregiving they receive, which also has implications for their later behavioral adaptation and adjustment.

Maternal behavior did not explain the link between mothers' depressive symptoms and children's later internalizing symptoms. Three alternative explanations for the direct association between maternal depressive symptoms and internalizing symptoms exist. First, depressive symptoms are heritable (Ferentinos et al., 2015; Jacobs, Orr, Gowins, Forbes, & Langenecker, 2015), therefore infants of mothers with elevated depressive symptoms may have inherited a

genetic propensity to internalizing symptoms. Second, the results could be a function of prenatal exposure to maternal depressive symptoms (Marcus et al., 2011). While pregnant, mothers with depressive symptoms are known to have elevated cortisol levels (Field, Hernandez-Reif, & Diego, 2011), and fetal exposure to elevated cortisol is linked with non-normative functioning in the Hypothalamic-Pituitary Axis, demonstrated by elevated Adrenocorticotrophic hormone levels (Marcus et al., 2011) and with greater frontal EEG asymmetry (Field & Diego, 2008) in infants at birth. However, this seems somewhat unlikely given our simple correlations demonstrate the postnatal depressive symptoms were more strongly correlated with later internalizing than were prenatal symptoms. Lastly, it may be the case that unmeasured aspects of maternal behavior contribute to these findings. For example, mothers with depressive symptoms may touch and hold their infants less or may be more tense when doing so (Field, 2007). These subtle variations in caregiving quality are difficult to observe, but they may affect infant stress arousal and regulation via the synchrony of bodily rhythms between mother and infant (Feldman, 2007). It has been proposed that this may in turn contribute to maladaptive infant outcomes (Leerkes, Su, O'Brien, Calkins, & Supple, 2016).

5.3. Pathways to externalizing behaviors

Contrary to prediction and prior research (Mantymaa et al., 2012, Shaw et al., 2001), maternal depressive symptoms, maternal unresponsiveness, and overtly negative behavior were not significantly associated with child externalizing at 2 years in the path model. Consistent with the results for internalizing symptoms, infant negative emotionality did not exacerbate links between maternal depressive symptoms and child externalizing behaviors, or the links between both insensitive maternal behaviors and child externalizing behaviors. The results of this study need to be interpreted with caution, as externalizing disorder consist of various types, including Aggression, Attention-Deficit-Hyperactive-Disorder, Oppositional Defiance Disorder, and Conduct Disorder. The BITSEA is too short a measure to tease out specific types of externalizing behaviors. It could be that the proposed model is more relevant to a subset of specific externalizing symptoms, most likely aggression, than to a broad array of externalizing symptoms.

Alternatively, it is possible that prior reported associations between maternal depressive symptoms and externalizing behavior are actually a function of the shared variance between internalizing and externalizing (Mantymaa et al., 2012). In this study, the shared variance between internalizing symptoms and externalizing symptoms was controlled by allowing them to correlate in the path model in contrast to much previous research. Thus, results indicate that maternal depressive symptoms, maternal unresponsiveness, and maternal negative behaviors are not linked with pure externalizing symptoms. Importantly, not much is known about the etiology of co-occurring internalizing and externalizing behaviors (Edwards & Hans, 2015). In future research, it may be useful to consider a person-oriented approach and identify children with consistently low symptoms, those with elevated internalizing only, elevated externalizing only, and comorbid symptoms to determine if each profile or class has unique predictors. Such an approach would likely require a larger sample.

5.4. Strengths, limitations, and future directions

A number of strengths and limitations of the study warrant comment. First, that the community sample is diverse with respect to race and socio-economic status is a strength compared to much of the prior literature, allowing for formal testing of race as a moderator. The multi-group analysis demonstrated that results were comparable for African American and European American dyads. The careful observation of two types of insensitive behavior during distress-eliciting tasks is also a strength. There are multiple ways in which mothers behave insensitively, and the two under consideration (unresponsive and overtly negative behavior) demonstrated a different pattern of associations with maternal depressive symptoms and child outcomes, indicating the importance of a nuanced approach to coding maternal behavior rather than relying solely on global indicators of sensitivity. Of note, some mothers may engage in both types of insensitive behaviors, alternating between overtly negative behaviors and unresponsiveness, whereas others may behave in a characteristically unresponsive or characteristically negative manner. Future examination of the impact of patterns of maternal behavior on infant outcomes would be useful. Lastly, a strength of this current study was that we tested a complex moderated mediation path model using structural equation modeling with Mplus version 7 (Muthén & Muthén, 2012), as well as using recommended bootstrapping procedures. Most studies run each path separately, but this analysis method allowed for the entire path model to run simultaneously for each outcome in order to estimate associations while controlling for alternative relations.

Limitations include the lack of a clinical depression interview and the sole reliance on maternal report of child behavior problems given shared method variance with maternal reports of depression and the possibility of maternal bias. The latter concern, however, is attenuated by including concurrent maternal depressive symptoms as a covariate. Given reliance on a community sample, it is important to acknowledge that the results best reflect how relatively low levels of maternal depressive symptoms predict relatively low levels of child behavior problems. Results may have been stronger or may differ in a high risk or clinical sample (Goodman & Gotlib, 1999).

In conclusion, unresponsive and overtly negative maternal behaviors were examined as possible mediators of the relationship between maternal depressive symptoms and two dependent variables, child externalizing and internalizing behaviors, and infant temperament was examined as a moderator of the mediated relationship. Results indicated there were no indirect effects of maternal behavior on either outcome in the path model, and this did not vary as a function of infant negative emotionality. Elevated maternal depressive symptoms, high infant negative emotionality, and negative maternal behaviors were associated with heightened infant internalizing but not externalizing behaviors. However, the mechanisms explaining the association between maternal depressive symptoms and infant internalizing was not identified and warrants further examination.

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